Gender gap in graduate job quality in Europe – a comparative analysis across sectors of economy and countries

Predrag Lažetić*

[1] *Institute for Policy Research, University of Bath, Bath, UK;*

E-mail: P.Lazetic@bath.ac.uk

Twitter: @PLazetic

ORCiD: 0000-0003-4309-1267

This article has been published in the Oxford Reviw of Education

*corresponding author

The gender gap in graduate job quality in Europe – a comparative analysis across economic sectors and countries

Abstract

This paper investigates the gender gap in a wide range of labour market outcomes (income, skill utilisation, work autonomy, job security and work-life balance) for higher education graduates in different economic sectors, using combined REFLEX and HEGESCO surveys from 17 European countries. In particular, it assess how specific institutional characteristics (gender composition, different levels of educational attainment of the labour force, skill specificity and the private or public nature of employment) within sectors, influence the early career gender gap in job quality for highly educated workers in Europe. The study finds that from the start of their careers, male higher education graduates receive higher wages, yet women report better skill utilisation, work autonomy and job security. In terms of institutional factors that influence gender differences in job quality, the paper finds support for the view that in sectors in which women are predominant they suffer an income penalty, but not in other aspects of job quality. Skill specificity of the sectors has been found to have very little explanatory value when it comes to graduate labour market.

Keywords: gender; labour market outcomes; higher education graduates; gender segregation; Europe;

Data availability statement: The data that support the findings of this study are openly available in DANS - Data Archiving and Networked Services of NARCIS - National Academic Research and Collaborations Information System of the Netherlands at https://doi.org/10.17026/dans-z3s-a2dh and https://doi.org/10.17026/dans-zx6-6tnq .

Introduction

That women receive lower rewards than men in the labour market in terms of wages, job prestige and job authority has been well-documented in the economics literature (Anker & Office, 1998; Rosenfeld & Kalleberg, 1990; Stier & Yaish, 2014; Yaish & Stier, 2009). The gender pay gap in particular is persistent across Europe despite numerous policy and social changes which were anticipated to reduce it (Rubery & Grimshaw, 2015). The most recent

statistics in Europe clearly show that women are overrepresented in industries with low pay levels (and accordingly underrepresented in well-paid industries) (Boll et al., 2018). This gender duality of labour markets has been a topic of numerous valuable studies and different waves of theorists (Jenkins, 2017) yet the research focuses primarily on overall aggregate pay differences between genders neglecting several crucial problems. These are:

Firstly, the differences in gender inequalities are known to be different in the life and career stages of workers and for persons of different education and skill levels (Boll et al., 2016; Bukodi & Dex, 2010). Secondly, there is a variety of labour market outcome and pay is only one of them; gender differences in the labour market exist and have different logics when it comes to job content, work autonomy, work-life balance, job authority and other important labour market outcomes (Stier & Yaish, 2014). Thirdly and most importantly, labour markets are plural and segmented (into nations, sectors, occupations etc.) and gender inequalities might have very different underlying rationales in different segments contributing to the overall gender segmentation of work and domestic life (Jenkins, 2017). How occupations and sectors of employment are distributed in individual countries matters and has to be taken into account when making any kind of cross-country comparisons of gender inequalities (Rubery & Fagan, 1995). Yet, sectoral heterogeneity remains largely overlooked in previous empirical analysis.

This article offers an important empirical contribution to the study of gender inequalities in the labour market by addressing the aforementioned problems by focusing on a very specific labour market segment in terms of age, life stage and education level: highly educated workers in their early careers. This approach allows the analysis of finer nuances of gender inequality and identification of gender inequality patterns in the labour market which might be very different compared to the situation in the overall labour force. The paper further investigates the gender gap in a wider range of labour market outcomes than is

typically the case – in addition to considering income, we are also able to look at gender differences in skill utilisation, work autonomy, job security and work-life balance, using combined REFLEX and HEGESCO graduate surveys from 17 European countries. Focusing on labour market outcomes beyond income, our research takes a more holistic approach to understanding labour market conditions and rewards which adds to the growing number of studies on job and employment quality (Gallie, 2008; Green, 2006; Jarman, Blackburn, & Racko, 2012; Munoz de Bustillo, Fernandez-Macias, Esteve, & Anton, 2011; Stier & Yaish, 2014). The problem of the different structure of labour markets across nations in terms of sectors and occupations, has been addressed by the choice of multilevel modelling. The graduate labour market in this study is seen as segmented into sectors of the economy in each nation, while occupational categories are taken into account as one of many individual characteristic of jobs within sectors of the economy. This technique, that effectively compares sectors of employment across European countries, takes into the account natural clustering of labour markets which is possible given the size of the survey sample. It allowed us to avoid using problematic national aggregate measures or the use of broad occupational subgroups as the main segmentation category (as in e.g. Stier and Yaish 2014; Charles 1992).

Theoretically the article is placed within the ongoing discussion on institutional factors which influence gender inequalities in the labour market. More specifically and given the sectorial analytical focus, the main research question asked is*: how and to what extent do the characteristics of the sectors of employment in different countries explain the gender differences in graduate labour market outcomes.*

The main theoretical contribution of the article is that it broadens and contextualises the discussion of institutional factors which influence gender inequality illuminating the complexity often obscured by more general theoretical claims. The focus on gender segregation in many previous studies (England, Allison, & Wu, 2007; England, Budig, &

Folbre, 2002; Jarman et al., 2012; Leicht, 2008; Magnusson, 2013), as the only key factor, obscures the fact that other institutional factors e.g. the dominantly public nature of employment in the sector (education, health), play much more significant role in the explaining gender differences in multiple other aspects of job quality of higher education graduates.

The article proceeds as follows: the next section presents research questions and the theoretical framework for the analysis from which the research hypotheses are derived, this is followed by a section in which the data, key variables and methods are described. The findings section presents the results from different stages of multilevel modelling and is followed by a discussion in which these findings are placed in relation to existing theoretical understandings of gender segregation in the graduate labour market.

Theoretical considerations and hypotheses

The theoretical and analytical aim of this article is not to merely describe the gender gaps in terms of pay and quality of work in the graduate labour force but to explain how that gender gap is shaped by institutional factors, primarily at the sector level. These factors either might have a mitigating effect on gender inequalities or exacerbate existing inequalities.

Institutional factors and gender inequalities

As Blossfeld et al (2015) point out, gender inequalities cannot be simply reduced to being the product of negotiations and trade-offs between employers and prospective employees[1] or individual preferences[2] aimed at maintaining the dual gendered segmentation system in the

[1] As some individualist neo-classical economics accounts claim (Polachek, 1981)

[2] On similar lines to individual choice arguments, Hakim's (Hakim, 2002) controversial preference theory stipulates that women (and especially part-time working women) select occupations based on their values and preferences for certain life-styles.

labour markets. Labour market outcomes and potential gender differences within them are not only determined by neo-classical assumptions about universal market logics but strongly influenced by institutions such as collective bargaining, individual employer human resource policies, progression and probation systems and other mechanisms which strongly regulate access to specific occupations, sectors and level of rewards. The following sections identify some of the factors which theoretically explain different levels of rewards for men and women graduates in different sectors of economy and different occupations.

Gender segregation across sectors and occupations

Labour markets are both by generations of labour market theorists and feminist geographers and sociologists seen as segmented and segregated in terms of gender (Jenkins, 2017; Peck, 1996). The increased concentration of women in particular occupations and sectors of economy has been seen as an important institutional factor in explaining pay disadvantage for women across all occupations independent of their gender composition (Addison, Ozturk, & Wang, 2018; Levanon, England, & Allison, 2009).

Two major theoretical accounts are usually identified as potential explanations of why occupations and sectors with high proportions of women bring less labour market rewards for women (Blossfeld, Skopek, Triventi, & Buchholz, 2015): devaluation of female work and skill specificity.

Devaluation: argues that society guided by *patriarchal cultural norm*s culturally sees female characteristics as less valuable than male and consequently, in general, values female work less than male work (Kupfer, 2014). Patriarchal cultural norms are based on cultural stereotypes about "natural" abilities and inclinations of men and women for specific occupations and study disciplines (gender essentialism)[3] that guide the processes of self-

[3] An excellent overview of these positions has been provided in England, 2010.

selection into specific gendered educational and career pathways. These norms are then eventually institutionalised in different wage structures and lower wages in female dominated occupations and sectors for both men and women. For example, both male and female nurses in the health sector are seen to be penalised for doing culturally constructed female work. It is claimed (Reskin and Roos 1990) that there is a gender queue for entrance to more male-dominated occupations and women's entrance to these sectors and occupations takes place when work conditions in these occupations deteriorate.

Skill specificity: is a specialised version of human capital theory which explains the difference in wages between male and female dominated sectors of the labour market not as a consequence of gender but as a consequence of the lower level of skill specificity in these occupations and sectors (Tam 1997). From the perspective of higher education, investment in more specific skill acquisition through specialisation is, in human capital theory terms, a more risky and costly strategy than studying more generally applicable study programmes. Very specific skill and knowledge sets have limited application and imply a lack of transferability across jobs and sectors (e.g. medicine, architecture etc.), hence employers in these sectors have to award more to their graduate employees in order to secure an adequate supply of staff. Women tend to opt for more general and less skill specific study programmes hence self-selecting them out of higher rewards in the labour market. So far, empirical studies have found some support for the claim that women earn less than men because they work in occupations and sectors requiring less specialised human capital (Perales, 2013), other studies have found no such relationship (England, Hermsen, & Cotter, 2000; Tomaskovic-Devey & Skaggs, 2002). Studies of the pay gap among higher education graduates in Germany (Leuze & Strauß, 2016; Ochsenfeld, 2014) indicate that in the case of this high skilled segment of the labour force, specificity of skills does not hold much explanatory power to explain wage differences because sectors with a high share of "female-typical" tasks like nursing and

teaching pay equally high wages compared to other jobs. The previous findings from Germany are not easily applicable for the other national contexts or to Europe in general, due to the relatively high level of pay in the sectors dominantly occupied by women (teaching or nursing).

Based on these work devaluation accounts we can suggest the following hypotheses:

H1: The concentration of female graduates in a sector has a negative effect in all aspects of job quality and in particular wages and increases gender differences.

Following the argument of market segmentation and skill specificity theories the following hypotheses can be posited:

H2: Economic sectors with high levels of skill specificity are more likely to have overall better quality of jobs with higher job quality in all aspects and in particular wages and this is to the detriment of women.

The Role of national institutional settings

Beside the competing theoretical arguments presented in previous sections at the individual and sectoral/occupational levels, there are also country-specific factors that impact the gender-specific labour market outcomes. They have been largely identified as differences of educational systems, labour market regulations, gender culture and the welfare state and its level of provision of support systems for childcare and parenthood (Blossfeld et al., 2015). Given the analytical focus of this paper, here we consider here only a small number of factors that are theorised to be significant factors present at the national level.

First, the varieties of capitalism literature (Hall and Soskice 2001 Amable 2003) as well as employment regimes typologies (Gallie 2008) stress that more coordinated labour markets do have higher union density and higher levels of collective bargaining of wages, which tend to

be factors which reduce inequalities in incomes including gender inequalities due to reduced levels of employer discrimination.

From this we can hypothesize:

H3: Higher union density and collective bargaining in the country reduces gender pay gaps.

Another group of country-level factors which are related to gender gaps in job quality relate to the functioning of the welfare state in different countries. For the purposes of this study it is crucial to understand the role of the *state as employer*. Due to their size, and stricter enforcement of regulations, governments as employers engage in collective bargaining and negotiations more and hence refrain from paying very low wages or directly discriminating against women (Kearney & Carnevale, 2001). However, more compressed wage differentials also imply lower earnings ceilings for those who work in the upper reaches i.e. professional and managerial roles (Mandel & Shalev, 2009) and many of these roles in the public sectors across Europe are occupied by women. Whether due to their own preferences or the absence of other opportunities, women are seen to be attracted to the shorter and more flexible hours (more work autonomy) found in the public sector, as well as public sectors' more reliable implementation of mothers' employment rights (Mandel & Shalev, 2009). In this way, the public sector's approach to women is seen to have perverse consequences on gender differences in labour market outcomes and gender segregation. It attracts highly educated women by offering them jobs in education and care work that are not highly paid compared to some private sectors, but are female-typed, offering more flexibility and work-time autonomy and are therefore better adjusted to family obligations. On the other hand socially liberated from domestic considerations, highly skilled men flock to the better-paying positions of the private sector (Hansen, 1997).

This leads to the final hypotheses:

H4: Graduate employment in public sector dominated segments of employment is associated with lower rewards in terms of pay yet higher rewards in terms of non-pay related aspects of job quality, regardless of gender.

H5: Gender differences in job quality should be generally smaller in public sector dominated segments of employment, yet women are expected to benefit more in terms of work (time) autonomy.

Data, variables and method

Data

For the empirical investigation, data from combined REFLEX[4] and HEGESCO[5] graduate surveys is used. Both surveys are cross-sectional surveys administered using the same instrument across countries[6]. In each country, the sample included tertiary education graduates from ISCED 5A type of study programmes (generally academic oriented) who received their degrees five years before the survey. The survey used stratified random sampling, based on regions and sectors of the higher education institutions graduates attended. The REFLEX survey was carried in 2005 in 14 European countries and Japan (list of countries and more details in the Table 1 in the Online Appendix: The HEGESCO Project was carried out two to three years later (2007 or 2008, depending on the country) in five additional European countries. Together, the surveys reached more than 145,000 graduates and had an overall response rate of 31%. In depth nature of these surveys, its large samples focused on recent

[4] A detailed description of the REFLEX project is available at http://www.fdewb.unimaas.nl/roa/reflex/ or in the overview report (Allen & Van der Velden, 2011)

[5] A detailed description of the HEGESCO project is available at http://www.hegesco.org/index.php or in the project report (Allen & Van der Velden, 2009)

[6] The two surveys used same questionnaires, have same variable names allowing for easy merge of the datasets.

graduate segment of the labour force, were most appropriate of this study of institutional factors which influence gender inequalities in the labour market, as they allow for analysis of differences both across countries and across sectors of economy as well the analysis of multiple labour market outcomes.

For the purposes of this analysis, data from Sweden were excluded, since its survey design deviates substantially from other countries (Verhaest & Van der Velden, 2013). Similarly, data from Turkey and Japan were excluded, due to the need to be able to link with data from the EU Labour Force Survey, which was used later in the analysis, for example, to derive weights and some of the explanatory variables required. Only graduates who were employed or self-employed at the time of the survey and were working in one of the 17 selected countries were included (regardless of which country they completed their degree). Taking into account all these reductions, the final sample contained 32445 graduate workers in 17 European countries. The key descriptive statistics of the data set can be found in the Online Appendix (Table 2).

In order to support the generalization of findings across young graduate labour forces in Europe, the sample was weighted in order to be representative at the country and sector level. This was achieved by calculating proportionate weights based on custom-made EU Labour Force Survey data extractions provided by EUROSTAT and assigning them to individual REFLEX/HEGESCO respondents. For purposes of multilevel modeling two sorts of weights were assigned (based on guidance of Centre for Multilevel Modelling, 2011). One first set of weights (level 2 weights) represent the inverse probability of a sector to be selected within a country. The second set of weights (level 1 weights) represents the inverse probability of an individual of specific occupational group to be selected within each sector of economy. For the weights calculation, employed individuals aged between 25 and 34 years and with higher education degrees are taken as the reference group to be the most similar to respondents of the

REFLEX and HEGESCO data (more details on weight calculations and their assignment can be provided by the author upon request).

Sectors of economy

One of the key analytical contributions of this article is its understanding of clustering within the graduate labour market in Europe. The analysis takes into account that the graduate labour market is clustered into different sectors of the economy, which have characteristics that influence the gender gap in graduate labour market outcomes. In order to avoid standard aggregation into major categories which often classify together very different activities (e.g. medicine and social work), sectors were reclassified by recoding the different levels the *Statistical classification of Economic Activities in the European Community (NACE)* into 18 sectors (list provided in the Online Appendix Table 1).

The total number of sectors covering more than 95% of all graduates in the sample in the 17 countries under analysis was 258, with the majority of countries having all the aforementioned sectors present in their graduate sample. Each sector included at least 20 employed graduates within survey, while average sector sample size is around 125 graduates.

Dependent variables

This research adopted a widely used definition of job quality as the sum of work and employment conditions related to particular jobs, which to different extents foster beneficial outcomes for the employee, including psychological and physical well-being, as well as positive attitudes like job satisfaction, commitment and turnover intentions (Green, 2006; Hauff and Kirchner, 2014; Holman, 2013). This study chose five dimensions of job quality based on the review of literature (Green, 2006; Muñoz de Bustillo & José Ignacio Antón, 2011) and available variables within the dataset: income, skill utilisation, work autonomy, job security and work-life balance. Details of the dependent variables are presented in the Table 1

and key descriptive statistics (mean and standard deviation) in the Table 2. The variable hourly wages is based on the reported gross monthly wage in Euros, adjusted for purchasing power parity, which was divided by contractual working hours in order to make it more comparable across countries and types of contracts. In this way, this variable captures productivity and also serves as a proxy for income and resources. Variables of skill utilisation, work autonomy, job security and work life balance are based on the survey questions (one or more) about graduate's perceptions about their current job. In cases where there are several questions related to the key variables, factor analysis was conducted to reduce the dimension to one underlying factor (more details in Table 1). All dependent variables have been rescaled between 0 and 100 by subtracting the minimum and then dividing by the range and multiplying with 100 in order to facilitate easier interpretation of results, however one should be aware that these maximums and minimums do not refer to absolute presence or absence of underlying concepts e.g. job security.

INSERT Table 1 HERE

INSERT Table 2 HERE

Independent variables: individual level

The main independent variable of interest is gender (0= male, 1=female). The models control for a further 13 individual level characteristics which in other studies have been found to affect job quality (e.g.Yaish and Stier 2009; Stier and Yaish 2014; Triventi 2013). These variables are: age, children, occupation, job authority (supervision), average hours of work, duration of the current employment, contract type, firm size, field of study, academic prestige of the study programme, vocational orientation of the study programme, match between own level of education and current job requirement, and match between own field of study and current job requirement. Details of these variables can be found in the Online Appendix

(Table 3).

Independent variables: sector and country level

The main interests of this study are the effects of the gender composition of the sector, as well as the skill specificity within sector, on gender differences in job quality. Skill specificity was orperationalised as the specificity of educational degrees in terms of field of study for the ther work in the sector. Presence of the internal market logic and skill specicity have been theorised as strongly correlated (Blossfeld et al., 2015). As the proxy measure of the presence of the internal market logic within sector, the impact of the level of educational attainment in the sector was taken into account. Similarly, the extent to which the sector was dominated by employment by the state (i.e. public sector) was taken into account. In line with the theoretical discussion and hypotheses, each sector was then characterised, separately in each country, by four indicators: 1) percentage of women graduates employed, 2) level of skill specificity in the sector, 3) percentage of graduates in the sector who indicated that they work in the public sector (i.e. the extent of the public nature of the sector[7]), and 4) percentage of workers with higher education degrees (proxy measure of the presence of internal markets). The first three indicators are derived by aggregation from the individual level variables in the survey described in the (gender, match between graduates' own field of study and job requirements and public/private sector variable with regard to the current job). The fourth indicator, which is the percentage of highly educated workers in the sector, is based on the EU Labour Force Survey[8]. Custom made tables were provided to the author by

7 Most sectors are not exclusively public or private e.g. in the health sector or education there are some graduates who work for private providers.

8 The EU Labour Force Survey custom based extracts provided by EUROSTAT were limited and could not contain gender variable due to the very small number of cases in some occupations and sectors, hence the first indicator had to be derived from the REFLEX and HEGESCO survey.

EUROSTAT. The percentage of workers with higher education degree in each of 258 sectors in 2005 has been taken as the reference. Besides these four sectoral indicators, for the income dimension of job quality, two country-level indicators have been taken as the independent variables: union density in the country and percentage of wages and employment in the country covered by collective bargaining. These indicators have been taken from the OECD statistics provided from 2005 and 2008.

Method

The study uses multilevel modelling which makes it possible to test for micro (individual level) and meso-level (sector level) and macro level (country level only used for predicting income) effects and their interaction. The key interests of this research were gender differences (gender gap or penalty) in job quality among higher education graduates employed in different sectors of the economy in 17 European countries, and how sectoral contextual effects (percentage of graduate women in the sector, level of skill specificity, public nature of the sector and level of higher education attainment in the sector) influence that gap.

Multilevel modelling builds the model from the initial single model which does not allow random effects at the sector and/or country level. The basic (zero model) single level regression model in this case is following:

$$\text{Job quality dimension}_i = \beta_{0i} + \varepsilon_i \qquad (0)$$

Subsequently, the intercept (β_0) was allowed to vary (be random) at the sector level (j) and country level (k) to establish the validity and statistical significance of the two or three level solutions for estimating each of five job quality dimensions and to estimate overall variance at each of these levels (Model 1). As presented in the next section, the variance at the country

level was not significant for any job quality dimension apart from hourly wages[9], hence a further description of the models focuses on sectoral intercepts and gender slopes.

$$\text{Job quality dimension}_{ij} = \beta_{0ij} + u_{0j} + \varepsilon_{ij} \quad (1)$$

After establishing the better fit of the multilevel models compared to the single-level models and the variance partition on each of these models, a set of individual-level control variables (gender + 13 other variables) and 4 contextual (sectoral) effect variables (and in the case of income additional 2 country-level control variables) were introduced as follows:

$$\text{Job quality dimension}_{ij} = \beta_{0ij} + u_{0j} + \beta_1(\text{Female})_{ij} + \beta_2 X_{ij} + \beta_3 Z_{ij} + \varepsilon_{ij} \quad (2)$$

The second model is a within-sector equation where the job quality of individual *i* in country *j* is the dependent variable; β_{0ij} denotes general intercept while u_{0j} denotes the (sector specific) intercept; β_1 represent the effect of being a women and the vector X denotes all the other 13 individual-level control variables and the vector Z denotes 4 sector-level variables otherwise known as contextual effects, β_2 and β_3 represent their coefficients, and ε_{ij} is the error term. In equation 2, the intercept is allowed to vary cross-sectors (random intercept), while the effects of the control variables including gender are constrained to be the same across sectors.
In the next step (3), the gender coefficient β_1 has been also allowed to vary across sectors (random slope) and the significance of this variation of gender gaps across sectors β_{1j} is tested:

[9] Model for hourly wages is the same as Model 1 with additional country intercept ν_{0k} while other coefficients also vary across countries and have subscript *ijk* .

$$\text{Job quality dimension}_{ij} = \beta_{0ij} + u_{0j} + \beta_{1j}(\text{Female})_{ij} + \beta_2 X_{ij} + \beta_3 Z_{ij} + \varepsilon_{ij} \quad (3)$$

The significance of random gender slopes was only tested for the job quality dimensions in which model 2 indicated that outcomes significantly vary between genders. The next modelling step was the introduction of interactions between significant contextual effects determined in the model 2 (percentage of women, skill specificity in the sector, public nature of the sector and higher education attainment in the sector) and gender gap slopes aiming to examine whether the specific sector characteristics narrow or widen gender gap in job quality (4).

$$\text{Job quality dimension}_{ij} = \beta_{0ij} + u_{0j} + \beta_{1j}(\text{Female})_{ij} + \beta_2 X_{ij} + \beta_3 Z_{ij} + \beta_4(\text{Female})xZ_{ij} + \varepsilon_{ij} \quad (4)$$

Significant interaction terms between gender slopes and contextual effects β_4 indicate for example, that a higher percentage of women within sectors decreases or increases the pay gap between men and women. Given that men are the reference category in the Female variable, coefficient β_3 in the model 4 estimates the effect of the contextual effect Z on men in the sector *j* while the effect of Z on women in the sector *j* is the male effect plus the the interaction coefficient $\beta_{3+}\beta_4$.

Findings

Initial multilevel models and variance partition

For all outcomes (job quality dimensions), the variance between clusters was statistically significant, which justifies the choice of multilevel models over single level ones, indicating the natural clustering of graduates within the sample into sectors of economic activity (258 sectors) and into countries (17) (model results for zero level models not presented here). Due to the relatively small number of countries, variance at the country level was limited, so for

the majority of job quality dimensions (skill utilisation, work autonomy, job security and work-life balance), the two-level basic models (individual nested in sector of employment) represented the best fit. In the case of hourly wages, there was in general more variance at the country level than at the level of the employment sector, so the 3 level model (individual – sector of economy – country of employment) represented the best fit compared to single-level models or two-level models.

Table 3 shows the partition of variance across levels of individuals, sector of economy and country of employment. As can be seen, the greatest variation in skill utilisation, work autonomy, income, job security and work-life balance reported by graduate workers emerged to be between individuals. Variance at the sector of economy level was highest in the case of work-life balance (9.74%), followed by job security (8.42%), work autonomy (8.36%), income (8.12%), and skill utilisation (7.04%).

INSERT Table 3 HERE

Gender differences in job quality and fixed individual and contextual factors

The main effects of the findings from the random intercept models (model 2) with all individual and contextual factors are presented in following Table 4 and discussed in the subsequent sections. Presented results (coefficients in Table 4) indicate outcomes for all graduates while the gender effect in Model 2 is fixed and the same for all sectors. Subsequent sections and tables analyse how this gender effect varies across sectors.

INSERT Table 4 HERE

Gender differences in job quality

Turning first to the key topic of this paper, the effect of gender on the different measures of job quality, the results in the Table 4 suggest, that even after controlling all other individual and contextual characteristics including differences in education, young highly educated

women report a clear and significant advantage in job skill utilisation, work autonomy and job security compared to young highly educated men, while they get less paid. On a 100 point scale, they had the greatest advantage in terms of job security ($\beta = 2.646$, $p < 0.05$), followed by work autonomy ($\beta = 1.845$, $p < 0.05$) and skill utilisation ($\beta = 1.358$, $p < 0.01$), while they receive significantly less money for their work ($\beta = -1.622$, $p < 0.05$). These findings contradict many findings based on studies of the entire labour force (England, 2010; Stier & Yaish, 2014) indicating that young graduates mostly in professional roles do have very distinct gender differences in job quality compared with the labour force as a whole in which almost all aspects of job quality dimensions women lagged behind men.

Individual-level effects on graduate job quality

Before addressing the main interest of the analysis, which lies in macro or sector/country effects on job quality and its dimensions and gender differences in these labour market outcomes, some individual-level relationships deserve mention. Given the education focus of this journal and the special issues we focus on education related individual-level effects. Labour market returns differ based on the field of study and the type of study programmes regardless of gender. Graduates who completed study programmes that they assessed to be more academically prestigious than the average in their country are getting a premium in all aspects of job quality indicating that they end up in high quality jobs. The highest premium seems to be in terms of skill utilisation, followed by work-life balance, job security, hourly wage and finally work autonomy. Graduating from a more than average vocationally oriented study programme is, on the other hand, only associated with higher skill utilisation, which we might expect due to the stronger link between education and potential work requirements, and with higher levels of job security. It also brings a very small penalty in terms of pay. In other job quality dimensions, a more than average vocationally oriented study programme brings no added premium. Underemployment, both in terms of having a job in lower and medium

occupational categories and jobs with an educational requirement that is low compared with a graduate's level of education brings penalties in skill utilisation, work autonomy and income, while in job security and work-life balance differences are not significant. Having a job with a high level of skill specificity, for which exclusively one or a small number of fields of study are a suitable match, brings very strong premiums in terms of skill utilisation ($\beta = 22.905$, $p < 0.05$) and work autonomy for all graduates. This indicates a strong link between graduates' understanding of skill utilisation as using skills and knowledge acquired in higher education studies.

Fixed contextual sector and country level factors and graduate job quality

In order to prevent repetition, the general effects of the contextual factors in Table 4 based on the random intercept model (3) will be discussed and presented in the subsequent step (model 4) which allows us to see if these sector and country level characteristics affect young highly educated men and women differently.

Gender gaps and their variation

The significance of gender gaps variation across sectors of economy was tested by allowing the gender variable to vary across the sectors of economy (in the case of hourly wages to vary both across sectors and countries). The models presented in Table 5 show that gender gaps in skill utilisation, work autonomy and job security do indeed vary significantly across sectors of economy, and in the case of hourly wages vary significantly both across sectors and across countries even after controlling for numerous individual and contextual factors[10]. Some patterns of this variation in the gender gap emerge.

[10] Random slope model for work-life balance was not modelled or reported due to non-significant fixed gender effect on this dimension of job quality (Table 4).

The negative covariance coefficients between intercepts and slopes indicate (Table 5) that gender gaps tend to be smaller in the sectors with high overall level of job quality. In other words, with the increase of job quality in the sector gender slopes become less steep creating so-called "fanning in" effects on the slopes. This is illustrated graphically (see Figures 1 and 2 in the Online Appendix) for the examples of the gender gaps in skill utilisation in manufacturing (lower job quality sectors) and gender gaps in skill utilisation in health sectors (higher quality sectors). As seen in the charts presented in the Online Appendix, the differences between men and women are much bigger in manufacturing (steeper slopes) than in health (many almost flat slopes).

INSERT Table 5 HERE

Contextual effects and their interactions with gender gaps in job quality

We now turn to the main interest of this study, which is how various institutional factors at the sector and country level influence overall graduate job quality and if and how they influence gender gaps in quality present at the individual level within sectors. The overall effect of sector and country level characteristics on job quality dimensions is presented in the Table 4 yet the assumption of these estimations is that they affect men and women across sectors equally. Since the main interest of the study is the effect of sectoral indicators on gender slopes (in the case of hourly wages also country indicators), attention is focused on the cross-level interaction effect between sector (Level 2) and country level (Level 3) characteristics on gender (Level 1). We tested these cross-level interactions (model 4) only for contextual factors which were significant in the random intercept model (3) presented in Table 4. In model 4, the main effect (effect on the intercept) pertains to male graduate workers, while the interaction effect (effects on the gender slope) denotes deviation of the women's slope from the men's. Table 6 presents the result of the Model 4 and described

cross-level interactions (all models include also all individual level control variables which are not presented due to space limitations).

INSERT Table 6 HERE

Gender segregation in sectors

The percentage of female graduates employed in the sector (gender segregation) which is widely theorized to have a negative effect on job quality (hypothesis 1) indeed has a negative effect ($\beta = -3.154$, $p < 0.05$ in Table 4), but only on graduates wages and not on other dimensions of job quality. The devaluation theory of female work has been therefore only partly supported. In the case of work of early career graduates, claims of female work devaluation theory do not see to have support when it comes to skill utilisation, work autonomy, job security and work-life balance. In all these dimensions (apart from work-life balance) female graduates on average report higher levels of job quality than their male colleagues as explained previously and that has nothing to do with the percentage of women in the sector of employment. When it comes to these dimensions of job quality women seem not to gain any advantage or penalty when working in female-dominated sectors (contrary to some findings of Yaish and Stier 2014 relating to the general labour force).

In the case of hourly wages situation is very different. Gender segregation in the sector (percentage of female graduates in the sector) widens the pay gap between men and women. Figure 1 illustrates this widening gap based on the predictions from Table 6. As coefficients in the Table 6

Tables and figures

Table 1: Dependent variables

Dimension	**Question**	**Computation and values**	**Factor loading if applicable**
Work autonomy*	To what extent are you responsible for setting goals for your own work?	1-5, not at all - to a very high extent	0.452

	To what extent are your responsible for deciding how you do your own job?	1-5, not at all - to a very high extent	0.698
	To what extent do the following job characteristics apply to your current work situation? Work autonomy	1-5, not at all - to a very high extent	0.793
Hourly wage PPP**	What are your gross monthly earnings?	Monthly gross salary in EUR x PPP coefficient/monthly working hours	n.a.
Skill	To what extent are your knowledge and skills utilised in your current work?	1-5, not at all - to a very high extent	n.a.
Job security	To what extent do the following job characteristics apply to your current work situation? Job security	1-5, not at all - to a very high extent	n.a.
Work-life balance/Flexibility***	To what extent do the following job characteristics apply to your current work situation? Good chance to combine work with family tasks	1-5, not at all - to a very high extent	0.772
	To what extent do the following job characteristics apply to your current work situation? Enough time for leisure activities	1-5, not at all - to a very high extent	0.772

* KMO=0.622, Cronbach's alpha= 0.675, principle axis factor (PAF)
**Values of the 3rd and 97th percentile have been assigned to 3rd and 97th percentile, respectively
***KMO=0.5, Cronbach's alpha=0.748, principle axis factor (PAF)
All indicators have been rescaled between 0 and 1 by subtracting the minimum and then dividing by range

Table 2: Descriptive statistics of the dependent variables

		Men	Women	Total
Skill utilisation	Mean	73.257	74.302	73.879
	S.D	25.028	25.886	25.547
Autonomy	Mean	78.316	78.966	78.702
	S.D.	19.978	20.823	20.487
Hourly wage PPP	Mean	21.128	18.628	19.624
	S.D.	9.689	8.465	9.056
Job security	Mean	67.988	70.195	69.302
	S.D	28.803	30.424	29.799
Work life balance	Mean	55.398	59.528	57.856
	S.D	26.027	26.681	26.496

Table 3: Variance partition in job quality dimensions

	Skill utilisation	Autonomy	Hourly wages PPP	Job security	Work life balance
Total graduate labour force					
Level 3: Country of employment	N.A.	N.A.	33.67	N.A.	N.A.
Level 2: Sector of economy	44.72*	32.07*	6.80*	75.59*	67.65*
Level1: Individual	590.46*	351.75*	43.32*	821.99*	626.63*
% of variance at the country level	N.A	N.A	40.18%	N.A.	N.A.
% of variance at the sector level	7.04%	8.36%	8.12%	8.42%	9.74%
% of variance at the individual level	93%	92%	52%	92%	90%
Total graduate labour force controlling for 14 individual level variables, 4 sector level variables and 2 country level variables (only in the case of income)					
Level 3: Country of employment	N.A.	N.A.	15.94	N.A.	N.A.
Level 2: Sector of economy	17.47*	25.95*	5.00*	52.71*	40.10*
Level1: Individual	461.93*	302.37*	37.84*	684.38*	577.12*
% of level 3 variance explained by explanatory variables	N.A.	N.A.	52.66%	N.A.	N.A.
% of level 2 variance explained by explanatory variables	60.94%	19.08%	26.49%	30.27%	40.72%
% of level 1 variance explained by explanatory variables	21.77%	14.04%	12.65%	16.74%	7.90%

*p< 0.05
N.A. indicates that there no significance variance at the country level

Table 4: Individual and contextual factors and job quality dimensions (Random intercept models)

-	Skill utilisation	Autonomy	Hourly wages PPP	Job security	Work life balance
Intercept	54.919*	76.205*	15.021*	61.958*	53.181*
Individual level variables					
Female	1.358**	1.845*	-1.622*	2.646*	-0.484
Age	0.178*	0.025	0.169*	-0.271*	-0.255*
Children	-0.640	2.197*	0.188	0.153	4.220*
Occupation (ref. *Associate professionals*)					
Clerks and lower categories	-5.964*	-3.750*	-1.459*	0.742	1.178
Professionals and managers	1.900*	1.520*	1.812*	0.773	-0.114
Supervision	0.961	7.332*	2.142*	2.703*	-3.525*
Hours of work	0.072*	0.092*	-0.069*	-0.055	-0.532*
Firm size	-0.314	-0.881*	0.527*	0.877*	-0.017
Experience in the current job	-0.008	0.008	-0.003	0.033*	-0.001
Contract type (ref. *Unlimited term*)					
Fixed term or temporary	-0.131	-2.271*	-1.381*	-25.934*	-4.247*
Other contract	1.231	0.945	-1.627*	-22.743*	-7.021*
Self-employed	2.119^	4.477*	-0.181	-11.607*	-1.913*
Study field (ref. *Arts and Humanities*)					
Education	-1.721	1.417	1.191*	-1.415	-0.349
Social Sciences, Business and Law	-2.474**	0.004	1.759*	0.769	2.698*
Science, Mathematics and Computing	-2.812	-0.127	0.645	-0.773	2.112
Engineering, Manufacturing and Construction	-5.576**	-1.621	1.166*	1.375	1.814
Agriculture and Veterinary	-5.752*	-0.644	-0.251	0.024	2.996
Health and Welfare	-1.271	-2.349	1.419**	2.496	-0.302
Services	-5.805*	-0.436	0.520	5.814*	3.396
Academically prestigious study programme	1.199*	0.585*	0.496*	0.742^	0.773*
Vocationally orientated study programme	2.160*	0.275	-0.187^	1.053*	0.082
Required level of education for the job (ref. category *Same level*)					
Higher level	4.986*	2.661*	-0.057	2.056**	-1.103
Lower level of tertiary education	-7.662*	-2.232*	-0.950*	3.022*	2.369*
Below tertiary level	-20.941*	-12.300*	-3.581*	-1.569	0.233
Best match job - field of study (ref. *Any field of study*)					
Exclusively own field	22.905*	3.512*	0.194	2.023	0.745
Own or related field	13.508*	2.073^	0.134	-1.019	-0.397
A completely different field	-2.367	1.546	-0.311	-2.584	-0.198

Contextual factors					
% of women graduates (sector)	-3.713	-2.902	-3.154*	4.387	2.504
% of highly educated workers (sector)	-0.064	0.104*	0.094	0.068	0.320*
Dominantly public sector	2.146	3.186*	-1.346	5.483*	16.627*
Skill specificity (sector)	3.585*	-1.547	-1.908*	0.039	-3.838
Union density (country)	N.A.	N.A.	0.087^	N.A.	N.A.
Coverage by collective bargaining (country)	N.A.	N.A.	0.090*	N.A.	N.A.

* $p < 0.05$

^ $p < 0.1$

Table 5: Gender random slopes in job quality

	Skill utilisation	**Autonomy**	**Hourly wages PPP**	**Job security**
Gender slopes - sector				
Intercept	37.508*	22.007*	7.324*	73.772*
S.E.	(11.971)	(4.003)	(0.734)	(11.434)
Intercept and slope	-30.625*	-7.592*	-4.370*	-42.522*
S.E.	(12.603)	(3.786)	(0.742)	(11.589)
Slope coefficient	45.521*	33.340*	7.335*	74.893*
S.E.	(13.711)	(5.883)	(2.013)	(16.631)
Gender slopes - country				
Intercept	n.a.	n.a.	18.459*	n.a.
S.E.			(5.733)	
Intercept and slope	n.a.	n.a.	-2.418	n.a.
S.E.			(1.606)	
Slope coefficient	n.a.	n.a.	1.469*	n.a.
S.E.			(0.491)	
Chi Square values	188.656*	180.855*	437.261*	196.238*
Degrees of freedom	3	3	6	3

All models include all 14 individual control variables and contextual effects (Table 4) which are not reported here in order to avoid repetition.

** $p < 0.05$*

n.a. = Not applicable due to no significant variance at the country level

Table 6: Cross-level interaction between gender slopes and sectoral characteristics

	Skill utilisation	**Autonomy**	**Hourly wages PPP**	**Job security**
Gender Slope coefficient (sector) after added interactions	45.492*	30.800*	7.191*	75.439*
Gender Slope coefficient (country) after added interactions	n.a.	n.a.	1.461*	n.a.
Chi squares after added cross-level interactions	0.028	12.448*	8.613*	0.619
Degrees of freedom	1	2	3	1
Effect on the intercept (Men)				
% of female graduates (sector)	n.a.	n.a.	-1.077	n.a.
S.E.			(1.837)	
% of highly educated workers (sector)	n.a.	0.059	n.a.	n.a.
S.E.		(0.056)		
Dominantly public sector	n.a.	0.067	n.a.	3.940
S.E.		(1.801)		(3.409)
Skill specificity (sector)	3.158	n.a.	-2.376^	n.a.
S.E.	(2.239)		(1.343)	
Coverage by collective bargaining (country)	n.a.	n.a.	0.108**	n.a.
S.E.			(0.030)	
Effect on gender slope (Women)				
% of female graduates (sector)	n.a.	n.a.	-3.243*	n.a.
S.E.			(1.339)	
% of highly educated workers (sector)	n.a.	0.084	n.a.	n.a.
S.E.		(0.071)		
Dominantly public sector	n.a.	4.348^	n.a.	1.780
S.E.		(2.432)		(3.654)
Skill specificity (sector)	0.345	n.a.	1.019	n.a.
S.E.	(2.306)		(1.324)	
Coverage by collective bargaining (country)	n.a.	n.a.	-0.010	n.a.
S.E.			(0.010)	

**p<0.01

* p <0.05

^p < 0.1

n.a. Interactions not included in the model as the main effect on job quality dimensions not significant

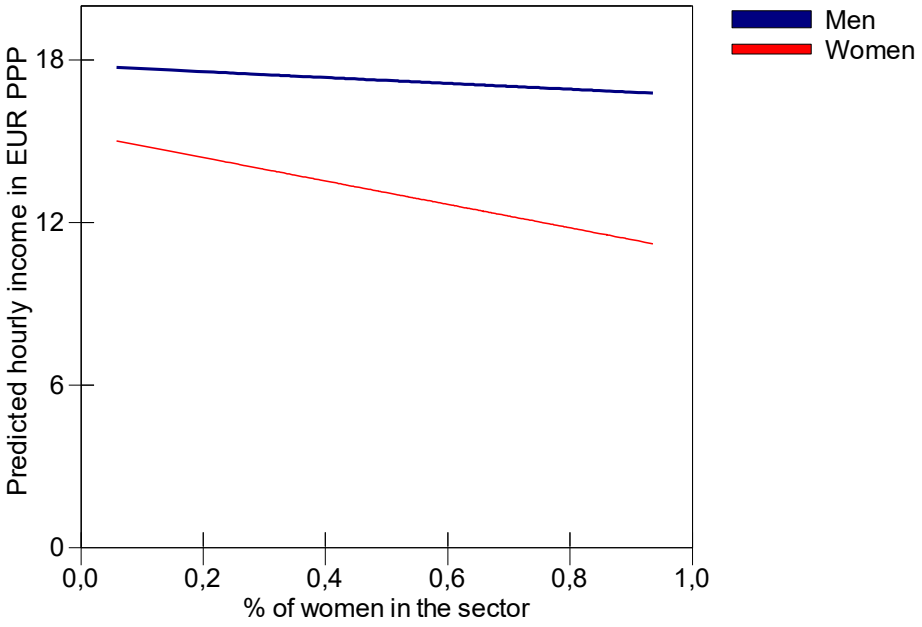

Figure 1: Impact of percentage of female graduates in the sector on gender gap in graduate hourly wages

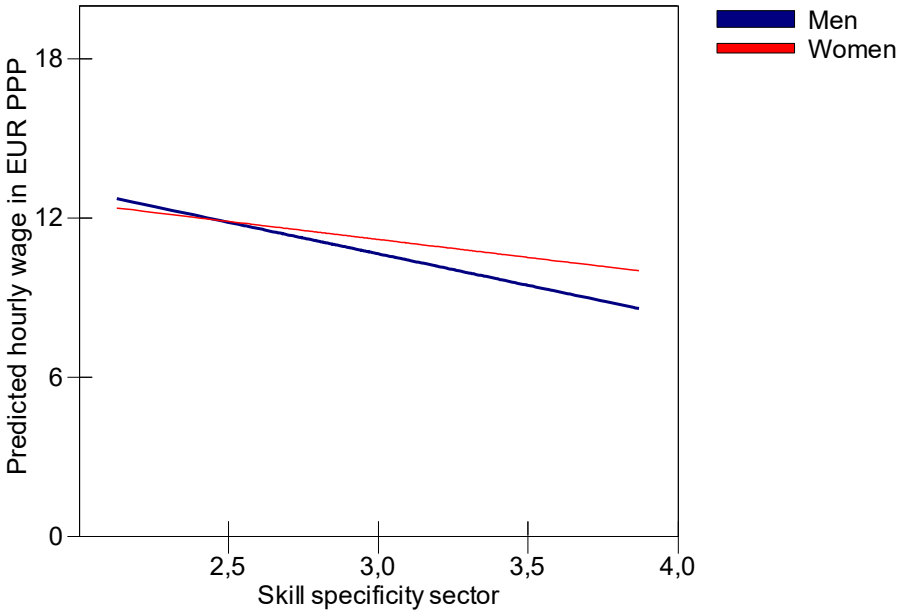

Figure 2: Impact of skill specificity in the sector on gender gap in graduate hourly wages

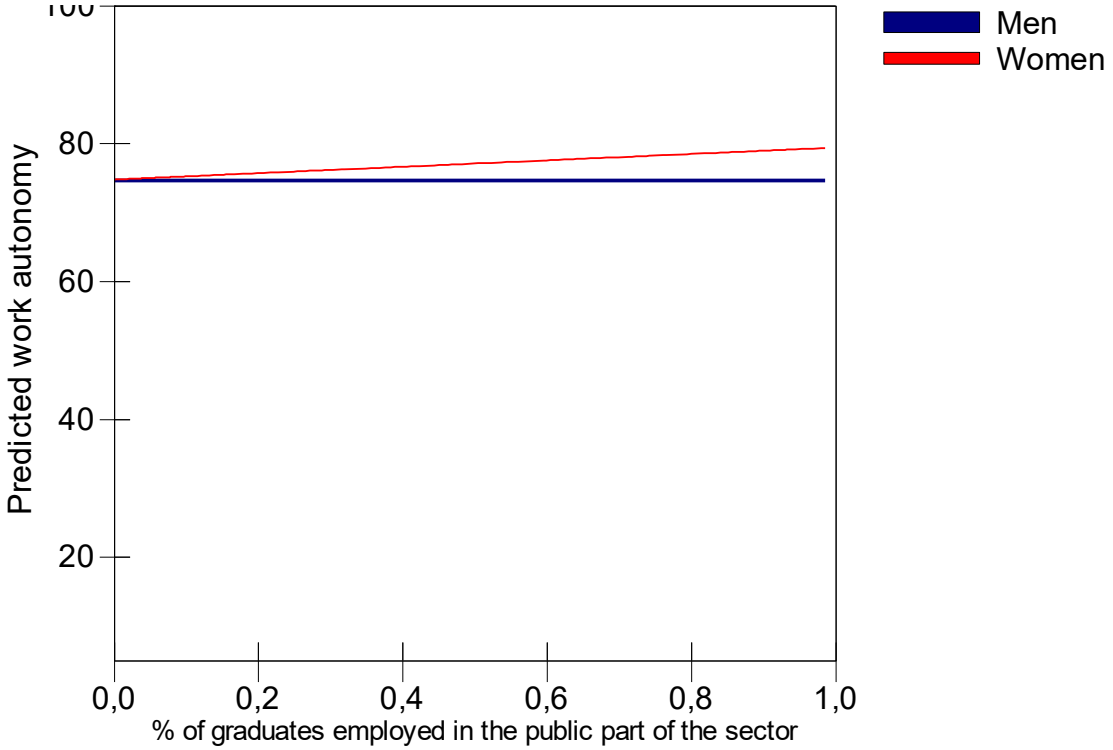

Figure 3: Impact of the dominantly public nature of the sector on gender gap in work autonomy

Online Appendices

Table 1: Analytical levels of the study design – countries and sectors

Level 3: Countries (17 countries)	Analysed REFLEX countries: Austria, Belgium-Flanders, the Czech Republic, Estonia, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden and the UK. Analyzed HEGESCO countries: Slovenia, Lithuania, Poland and Hungary Together, the surveys reached more than 145,000 graduates and had an overall response rate of 31%. Original REFLEX survey also included Sweden, Japan and HEGESCO Survey included Turkey. For the purposes of this analysis, data from Sweden were excluded, since its survey design deviates substantially from other countries (Verhaest & Van der Velden, 2013). Similarly, data from Turkey and Japan were excluded, due to the need to be able to link with data from the EU Labour Force Survey, which was used later in the analysis, for example, to derive weights and some of the explanatory variables required.
Level 2: Sectors (20 different sector types not all present in each country) Total number of country-sector combinations 258	1) Manufacturing; 2) Construction; 3) Wholesale and retail trade; 4) Transport and Communications; 5) Financial intermediation; 6) Computer related services; 6) Research and development; 8) Legal, accounting, bookkeeping and auditing activities; 9) Architectural, engineering and other technical activities; 10) Real estate, advertising and other business services; 11) Public administration and defense; 12) Primary and secondary education; 13) Higher education; 15) Other education; 16) Health; 17) Social work; 18) Media, culture, recreation, membership organisations.
Level 1: Individual jobs	Occupation, Job quality dimensions, Working hours, Type of contract, Educational background, Personal characteristics
Weighting procedure	For purposes of multilevel modeling two sorts of weights were assigned (based on guidance of Centre for Multilevel Modelling, 2011). One first set of weights (level 2 weights) represent the inverse probability of a sector to be selected within a country. The second set of weights (level 1 weights) represents the inverse probability of an individual of specific occupational group to be selected within each sector of economy. For the weights calculation, employed individuals aged between 25 and 34 years and with higher education degrees are taken as the reference group to be the most similar to respondents of the REFLEX and HEGESCO data (more details on weight calculations and their assignment can be provided by the author upon request).

Table 2: Characteristics of employed graduates 5 years after graduation (n=32445)

Personal characteristics	%
Gender	
Male	40.4
Female	59.6
Age	
≤ 26	3.4
27	10.0
28	15.5
29	17.5
30	13.7
31	10.2
32	7.0
33	4.9
≥ 34	17.8
Academic background	
ISCED5A* programmes providing direct access to doctorate	55.2
ISCED5A* programmes not providing direct access to doctorate	44.8
Disciplinary field	
Education	11.9
Humanities and Arts	9.7
Social sciences, Business and Law	32.9
Science, Mathematics and Computing	9.2
Engineering, Manufacturing and Construction	17.1
Agriculture and Veterinary	2.9
Health and Welfare	13.3
Services	3.1
Job characteristics	%
Sector	
Public sector	42.9
Private non-profit sector	6.5
Private profit sector	48.8
Other	1.7
Branch of industry	
A - Agriculture, hunting and forestry	1.0
B - Fishing	0.1
C - Mining and quarrying	0.7
D - Manufacturing	12.2
E - Electricity, gas and water supply	0.9
F - Construction	3.3
G - Wholesale and retail trade; repair of motor vehicles and other goods	4.7
H - Hotels and restaurants	0.7
I - Transport, storage and communications	3.8

J - Financial intermediation	5.2
K - Real estate, renting and business activities	17.6
L - Public administration and defence; compulsory social security	9.4
M - Education	20.4
N - Health and social work	15.1
O - Other community, social and personal service activities	
Size of company/organisation	
1-9	12.8
10-49	17.9
50-99	10.9
100-249	11.8
250-999	15.2
1000 or more	31.5

* International standard classification of qualifications level 5A

Table 3: Independent variables - individual level

Individual level variables	**Description/Question**	**Type and values**
Gender	Personal characteristic	Dummy variable. 1= Female. 0=Male
Children	Do you have children?	Dummy variable. 1=Yes. 0=No.
Age	Base on the question concerning year of birth	A continuous variable centred around the mean for each country
Occupation	*Occupation* measured at the individual level measured on the 1-digit level of ISCO88 classification grouped into 3 distinct occupational categories. The "high occupational group" category included managers and professionals; the "medium occupational group" includes technicians and associate professionals; and the "low occupational group" includes clerks and all remaining occupational categories.	Categorical: High level occupations Medium level occupations Lower level occupations
Supervision	Do you directly or indirectly supervise other members of staff?	Dummy variable. 1=Yes, 0=No.
Average hours of work	Average working hours (in a week including overtime)	Continuous variable: hours centred around the sector mean
Experience in current job	Duration from the start of work in current employment/self-employment	Continuous (months) centred around country mean
Type of contract	Type of contract in the employment or self-employment status	Categorical: Unlimited term or temporary Other Self-employed
Firm Size	How many people work in your organisation?	*Firm size* (centred around sector mean) measured on a 6 point ordinal scale: 1= 1-9; 2=10-49; 3=50-99; 4=100-249; 5=250-999; 6=1000 or more.
Study field	Coded based on the study reference study programme	Categorical: Education Arts and Humanities

		Social Sciences, Business and Law Science, Mathematics and Computing Engineering, Manufacturing and Construction Agriculture and Veterinary Health and Welfare Services
Academically prestigious study programme	To what extent did the following descriptions apply to your study programme – The programme was academically prestigious	5 point scale (centered around country mean) 1=not at all; 5=to a very high extent
Vocationally oriented study programme	To what extent did the following descriptions apply to your study programme – The programme was vocationally oriented	5 point scale (centered around country mean) 1=not at all; 5=to a very high extent
Match between own level of education and the current job requirement	What type of education do you feel is most important for this work?	Categories of degrees compared to own graduate degree and coded into 4 categories: Same level Higher level Lower level of tertiary education Below tertiary education
Match between own field of study and the current job requirement	What field of study do you feel is most appropriate for this work?	Ordinal scale with 4 categories rescaled so that higher values indicate higher specific skill demands : No particular field A completely different field Own or related field Exclusively own field

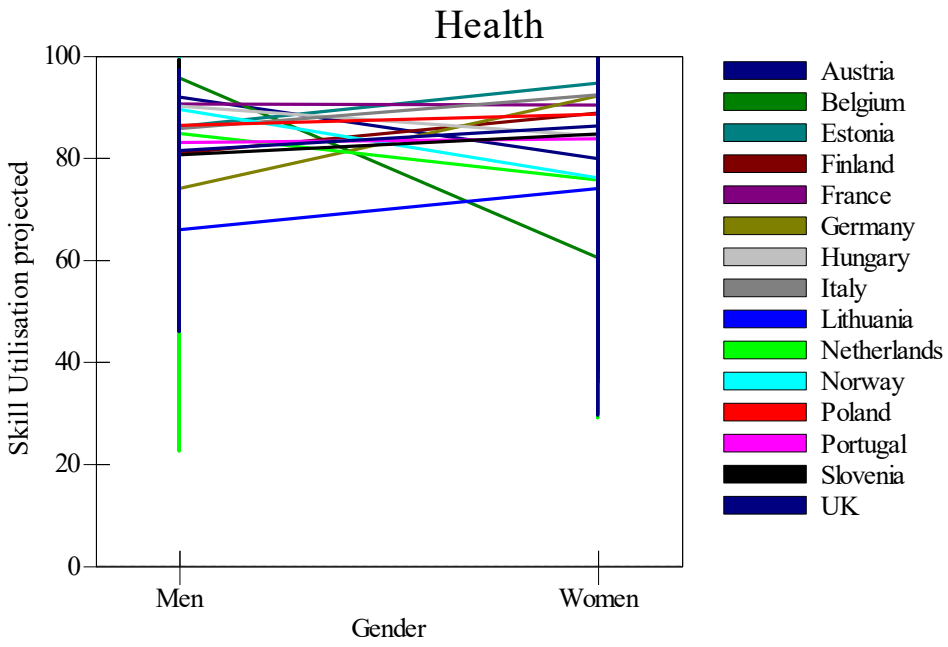

Figure 1: Gender gaps in skill utilisation in the health sectors in Europe

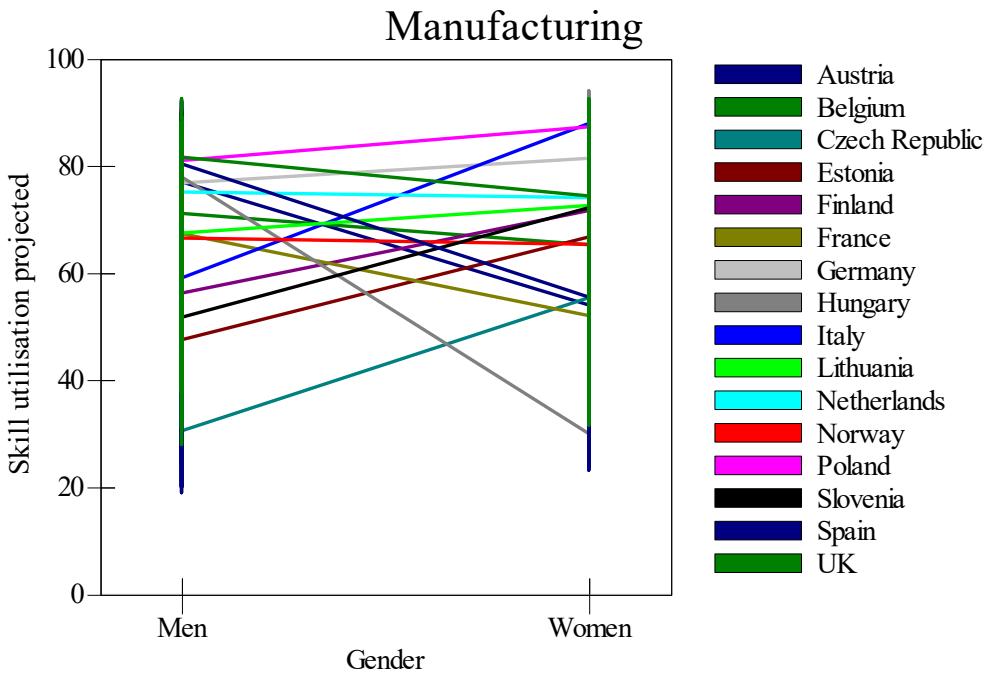

Figure 2: Gender gaps in skill utilisation in manufacturing sectors in Europe

indicate, women's concentration in sectors has a slight and not statistically significant effect on men's wages yet it has a significant negative on women's wages ($\beta = -3.243$, $p < 0.05$). In

real terms, this implies that a 10% increase of women in the sector is associated with a decrease of additional 0.324 Euro cents per hour for women. This equates to approximately 50 Euros per month in PPP for women in full-time work. This does not support fully the assumptions devaluation argument operationalised in the of hypothesis 1 as women and men are not equally penalised for doing devalued female work like this. In the women dominated sectors, men tend to be protected from pay penalties of gender segregation. When it comes to graduate wages the patterns suggested in studies of the entire labour market sustain.

INSERT Figure 1 HERE

Skill specificity and internal markets

When it comes to the level of skill specificity in the sector (the extent to which graduate work in the sector requires a very specific field of study), the expectations of the skill specificity theory (hypothesis 2) found mixed support. As indicated in Table 4 more skill-specific sectors of work do bring higher overall awards to graduates in terms of skill utilisation ($\beta = 3.589$, $p < 0.05$), however work in high skill specificity sectors tends to be paid less ($\beta = -1.908$, $p < 0.05$). The last finding contradicts the expectations of the human capital theorists that highly specific skills gets particularly well rewarded by employers which are supposed to fear the loss of investment into recruitment and long periods of initial in-service training. In terms of wage penalties, skill specificity level in the sector does not seem to have a significant widening or narrowing effect on gender gaps as illustrated in Figure 2. While skill specificity has a significant (only at $p=0.07$) negative effect on men's wages ($\beta = -2.379$) the women's slope does not significantly deviates from the men's slopes. This is in the contrast to the expectations of the skill specificity theory with regard to gender gaps which expects widening of gender gaps in favour of men.

INSERT Figure 2 HERE

Secondly, the presence of internal market logic within a sector which usually works for jobs with high skill requirements is estimated by taking the percentage of highly educated labour force in the sector as a possible proxy measure. Findings presented in Table 4 indicate statistical significant, yet relatively small effect in terms of a positive correlation between work autonomy ($\beta = 0.104$, $p < 0.05$) and work-life balance ($\beta = 0.320$, $p < 0.05$) and the proportion of workers with higher education degrees in the sector. There are no significant effects of this sectorial factor on gender gaps. This partly contests the findings of Stier and Yaish (2014) which found that in the general labour force the proportion of higher education graduates in an occupation is associated with an increase in time autonomy for men, while for women it declined, resulting in an increase of the gender gap in time autonomy. The differences in findings are probably associated with different analysed dimensions and focus on sectors of employment rather than occupational groups.

Public nature of sectors

Confirming the expectations from the theoretical review and previous studies (hypothesis 4), employment in predominantly public sectors with their higher employment regulation and protection in itself very strong predictor of job quality in non-pay related aspects of employment while it is characterised by lower pay compared to dominantly private sectors. Employment in predominantly public sectors (health, education, public administration) does bring much higher levels of awards for graduates regardless of gender in terms of work-life balance ($\beta = 16.627$, $p < 0.05$), job security ($\beta = 5.483$, $p < 0.05$) and work autonomy ($\beta = 3.186$, $p < 0.05$) however it is also associated with lower incomes ($\beta = -1.346$, $p < 0.05$), see Table 4. In the work autonomy employment in the predominantly public sector has different effects on men and women, widening the general advantage women report when it comes to work autonomy. Figure 3 illustrates this widening gap in work autonomy favour of women. The percentage of public employment in the sector has a not statistically

significant effect on men's work autonomy yet it has a significant positive on women's work autonomy ($\beta = 4.348$, $p < 0.05$). This supports the expectations of hypothesis 5 that women benefit more from the protection of the public sector and work arrangements that allow more (time) autonomy (Yaish & Stier, 2009).

INSERT Figure 3 HERE

National institutional setting and pay gaps

Lastly, when it comes to the country level factors which influence the level of graduate incomes, the differences between countries seem to be explained by the level of coordination in the economy following the varieties of capitalism approach. The high levels of union density ($\beta = 0.087$, $p < 0.1$) and coverage by collective wage bargaining ($\beta = 0.090$, $p < 0.05$) both are positively associated with graduate wages (Table 4) supporting hypothesis 3. In terms of gender pay gaps, both factors do not seem to have a significant widening or narrowing effect on gender gaps (Table 6).

Discussion

In contrast to most studies of the entire labour forces (all ages and skill levels) that find a general disadvantage for women in most job quality dimensions (e.g. Stier & Yaish, 2014), this study has found that even after controlling all other individual and contextual characteristics including differences in education, young highly educated women working, compared to their male peers, have an advantage in terms of professional and organisational aspects of their jobs (skill utilisation, work autonomy, job security), yet they receive significantly less pay for the same work. Persistence of the gender pay gap has been found confirmed here. Nevertheless, this multifaceted multidimensional picture of labour market rewards is usually obscured in the plethora of studies which solely focus on wages and persistent problem of the gender pay gap. The striking differences between numerous

empirical evidence about general multifaceted disadvantage of women in the general working population and relatively positive picture about position of young female higher education graduates, has been found also in other studies (Leuze & Strauß, 2016). This finding points out at the probable problem of polarisation of labour market chances and outcomes between high-skilled and low skilled women. Further research should therefore not only observe a wider range of labour market outcomes, but also study gender differences in labour market outcomes in different educational and social strata separately.

Yet, the principle goal of this article was not just to describe deviations of graduate segment of the labour force from the rest, but to explain how that gender gap in this particular segment of the labour force is shaped by the institutional factors primarily at the sector level.

Devaluation due to feminization arguments (hypothesis 1) which are supported by many other longitudinal and cross-sectional studies although with many caveats (Busch, 2018; Grönlund & Magnusson, 2013; Levanon et al., 2009) are in this study supported only in the case of income. Working in more female dominated sectors after even after all other factors are taken into account increase the pay gap between man and women, yet this negative effect of sector feminisation is not gender neutral as it found to penalise only women. In other aspects of job quality neither of the theoretical explanations regarding the impact of gender segregation on job quality differences holds (hypothesis 1). Female graduates maintain their general advantage in labour market rewards like higher skill utilisation, work autonomy and job security regardless of the gender composition of sector. This is contrary the study of (Stier & Yaish, 2014), who found that women in high white collar occupations in general working population report disadvantage in terms of time autonomy, emotional conditions and the sense of achievement. This discrepancy[11] points at the possible impact of age and career stage

[11] The majority of the used sample of graduate workers is the age range 26-34.

of women at the perceptions of their work quality as many of the gender disadvantages for women might materialise at the later career stages when challenges of being burdened by the dual social and economic roles of carers/providers fully materialise.

Skill-specificity theoretical claims (hypothesis 2), which are partly found to be true in the case of longitudinal study base on three UK data sources (Perales, 2013) are not supported by findings of this study and in some elements even contradict the theoretical claims. This might be in part because of the very different operationalisation of the concept of skill specificity compared to approaches of Perales (2013) which takes measures like in-job training as the measure of skill specificity of the jobs along many others indicators like skill categorisation of particular occupations (Elias & McKnight, 2001) and partly because that study was only focused on wages. In the case of higher education graduates, many very skill-specific sectors with internal market organisation which demand specific level and field of study are actually relatively low paid e.g. primary and secondary education, and yet bring other types of labour market rewards. Although higher educational attainment as a proxy measure of internal market, and skill specificity in the sectors do in general positively associated with levels of skill utilisation, work autonomy, work life balance of graduate workers and of both genders, they do not have any significant effect on gender gaps in job quality dimensions. In the sharp contrast to the skill specificity theory, in the case of European graduates, work in a very skill specific sector actually even brings border line significant wage penalties for both genders. Potential explaination for this is that in many skill-specific sectors (law, medicine, architecture etc.) graduates are found in preparatory or initial training positions with relatively low wages, while in the low skill-specific sectors wages usually start at comparatively high level, yet they do not increase as much with work experience as in very skill-specific sectors.

The broader *institutionalist accounts* that that emphasise the role of welfare state and its collective bargaining policies as the crucial actor which sets directly and indirectly general conditions of work in many sectors (hypothesis 3), have been strengthened by findings of this study. The major finding of the study is that the dominantly public nature of employment in an economic sector rather than skill-specificity of work or gender composition of a sector is a much stronger predictor of the overall levels of skill utilisation, work autonomy, job security and work-life balance of higher education graduates. The work in the dominantly public sectors brings high rewards for both genders in work autonomy, job security and work-life balance and in the terms of work autonomy rewards are even higher for highly educated women. Dominantly public sectors like health and education on the other hand tend to be populated mostly by women and following devaluation logic have lower level of salaries, what is confirmed in this study as well. This combined impact of sector feminization and public characteristics of employment is however not present in all countries: in some European countries like Germany work in dominantly female high qualified occupations like teaching and nursing are relatively well paid (Leuze & Strauß, 2016). These findings strongly support both hypotheses 4 and 5. Characteristics of employment in the public sector described in the theoretical section do indeed have a perverse effect on gender differences in the graduate labour market and sustaining gendered segregation of economic sectors (Hansen, 1997). With regard to the largely positive findings about advantages of employment in dominantly public sectors in Europe with regard to non-pay related dimensions of job quality experienced by graduates, it is important to stress that the analysed graduate surveys date before the start of the economic crisis of 2008 and should be interpreted with that in mind. Many of the European governments responded to the crisis with extensive austerity policies. These austerity policies are found particularly harmful for working conditions of women as

they targeted public sectors which employ mostly women and are generally found to increase gender inequalities in the labour market (Karamessini & Rubery, 2013; Rubery, 2015).

Concluding remarks and higher education policy implications

This study of gender inequalities in the graduate labour market besides its primary aim to further academic discussion on mechanisms which shape gender inequalities in the labour markets in Europe, has also potential higher education policy implications. Especially in the higher education systems with high tuition fees which rely on the logic of "value for money" in relation to higher education degree returns and in systems which are governed and assessed by employability statistics and benchmarks, it is crucial to understand the gender dimension of graduate success in the labour market. Focusing solely on wages as the indicator of graduate success in the labour market, given the evidence of gender pay gap confirmed in this study, inevitably distorts the reality and creates more masculine-biased indicators. Taking into consideration measures like skill utilisation at work, work autonomy, job security and work-life balance, not only that it helps understand and better measure graduate labour market success of female graduates, but it can also potentially motivate applicants to study not very lucrative yet in other future job quality aspects very rewarding fields.

References

Addison, J. T., Ozturk, O. D., & Wang, S. (2018). The Occupational Feminization of Wages. *ILR Review*, *71*(1), 208–241.

Allen, J., & Van der Velden, R. (2009). *Competencies and early labour market careers of higher education graduates*. Ljubljana: University of Ljubljana.

Allen, J., & Van der Velden, R. (2011). *The flexible professional in the knowledge society: New challenges for higher education*. Dordrecht Heidelberg London New York: Springer Science & Business Media.

Anker, R., & Office, I. L. (1998). *Gender and Jobs: Sex Segregation of Occupations in the World*. International Labour Organization.

Blossfeld, H.-P., Skopek, J., Triventi, M., & Buchholz, S. (2015). *Gender, Education and Employment: An International Comparison of School-to-Work Transitions*. Cheltenham, UK: Edward Elgar Publishing.

Boll, C., Lagemann, A. (2018). *Gender pay gap in EU countries based on SES (2014).* Luxembourg: Publication Office of the European Union.

Boll, C., Leppin, J., Rossen, A., Wolf, A. (2016). *Magnitude and impact factors of the gender pay gap in EU Countries.* Luxembourg: Publication Office of the European Union.

Bukodi, E., & Dex, S. (2010). Bad Start: Is There a Way Up? Gender Differences in the Effect of Initial Occupation on Early Career Mobility in Britain. *European Sociological Review*, *26*(4), 431–446.

Busch, F. (2018). Occupational Devaluation Due to Feminization? Causal Mechanics, Effect Heterogeneity, and Evidence from the United States, 1960 to 2010. *Social Forces*, *96*(3), 1351–1376.

Centre for Multilevel Modelling. (2011, September 8). *Weighting in MLwiN*. Bristol: University of Bristol.

Charles, M. (1992). Cross-National Variation in Occupational Sex Segregation. *American Sociological Review*, *57*(4), 483–502.

Elias, P., & McKnight, A. (2001). Skill measurement in official statistics: Recent developments in the UK and the rest of Europe. *Oxford Economic Papers*, *53*(3), 508–540.

England, P. (2010). The Gender Revolution: Uneven and Stalled. *Gender & Society*, *24*(2), 149–166.

England, P., Allison, P., & Wu, Y. (2007). Does bad pay cause occupations to feminize, Does feminization reduce pay, and How can we tell with longitudinal data? *Social Science Research*, *36*(3), 1237–1256.

England, P., Budig, M., & Folbre, N. (2002). Wages of Virtue: The Relative Pay of Care Work. *Social Problems*, *49*(4), 455–473.

England, P., Hermsen, J. M., & Cotter, D. A. (2000). The Devaluation of Women's Work: A Comment on Tam. *American Journal of Sociology*, *105*(6), 1741–1751.

Gallie, D. (2008). *Employment Regimes and the Quality of Work*. Scopus.

Green, F. (2006). *Demanding work: The paradox of job quality in the affluent economy*. Scopus.

Grönlund, A., & Magnusson, C. (2013). Devaluation, crowding or skill specificity? Exploring the mechanisms behind the lower wages in female professions. *Social Science Research*, *42*(4), 1006–1017.

Hakim, C. (2002). Lifestyle Preferences as Determinants of Women's Differentiated Labor Market Careers. *Work and Occupations*, *29*(4), 428–459.

Hall, P. A., & Soskice, D. (2001). *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford: OUP Oxford.

Hansen, M. N. (1997). The Scandinavian Welfare State Model: The Impact of the Public Sector on Segregation and Gender Equality. *Work, Employment and Society*, *11*(1), 83–99.

Hauff, S., & Kirchner, S. (2014). *Cross-national differences and trends in job quality*. Retrieved from University of Hamburg, Germany website: http://www.bwl.uni-hamburg.de/pw/team/hauff-sven/pdfs/hauff-kirchner-2014-review-job-quality.pdf

Holman, D. (2013). Job types and job quality in Europe. *Human Relations*, *66*(4), 475–502.

Jarman, J., Blackburn, R. M., & Racko, G. (2012). The Dimensions of Occupational Gender Segregation in Industrial Countries. *Sociology*, *46*(6), 1003–1019.

Jenkins, S. (2017). *Gender, place and the labour market*. Aldershot: Routledge.

Karamessini, M., & Rubery, J. (2013). *Women and Austerity: The Economic Crisis and the Future for Gender Equality*. Abingdon: Routledge.

Kearney, R. C., & Carnevale, D. G. (2001). *Labor relations in the public sector*. New York: Marcel Dekker.

Kupfer, A. (2014). The interrelation of twenty-first-century education and work from a gender perspective. *International Studies in Sociology of Education*, *24*(1), 113–125.

Leicht, K. T. (2008). Broken Down by Race and Gender? Sociological Explanations of New Sources of Earnings Inequality. *Annual Review of Sociology*, *34*(1), 237–255.

Leuze, K., & Strauß, S. (2016). Why do occupations dominated by women pay less? How 'female-typical' work tasks and working-time arrangements affect the gender wage gap among higher education graduates. *Work, Employment and Society*, *30*(5), 802–820.

Levanon, A., England, P., & Allison, P. (2009). Occupational Feminization and Pay: Assessing Causal Dynamics Using 1950–2000 U.S. Census Data. *Social Forces*, *88*(2), 865–891.

Magnusson, C. (2013). More women, lower pay? Occupational sex composition, wages and wage growth. *Acta Sociologica*, *56*(3), 227–245.

Mandel, H., & Shalev, M. (2009). How Welfare States Shape the Gender Pay Gap: A Theoretical and Comparative Analysis. *Social Forces*, *87*(4), 1873–1911.

Munoz de Bustillo, R., Fernandez-Macias, E., Esteve, F., & Anton, J.-I. (2011). E pluribus unum? A critical survey of job quality indicators. *Socio-Economic Review*, *9*(3), 447–475.

Muñoz de Bustillo, R., & José Ignacio Antón, F. E. (2011). *Measuring more than money.The social economics of job quality*. Cheltenham, UK: Edward Elgar Publishing

Peck, J. (1996). *Work-place: The social regulation of labor markets*. London: Guilford Press.

Perales, F. (2013). Occupational sex-segregation, specialized human capital and wages: Evidence from Britain. *Work, Employment and Society*, *27*(4), 600–620.

Polachek, S. W. (1981). Occupational Self-Selection: A Human Capital Approach to Sex Differences in Occupational Structure. *The Review of Economics and Statistics*, *63*(1), 60–69.

Reskin, B., & Roos, P. (1990). *Job Queues, Gender Queues.* Philadelphia, PA: Temple University Press.

Rosenfeld, R. A., & Kalleberg, A. L. (1990). A Cross-National Comparison of the Gender Gap in Income. *American Journal of Sociology*, *96*(1), 69–106.

Rubery, J. (2015). Austerity and the Future for Gender Equality in Europe. *ILR Review*, *68*(4), 715–741.

Rubery, J., & Fagan, C. (1995). Gender Segregation in Societal Context. *Work, Employment and Society*, *9*(2), 213–240.

Rubery, J., & Grimshaw, D. (2015). The 40-year pursuit of equal pay: A case of constantly moving goalposts. *Cambridge Journal of Economics*, *39*(2), 319–343.

Stier, H., & Yaish, M. (2014). Occupational segregation and gender inequality in job quality: A multi-level approach. *Work, Employment and Society*, *28*(2), 225–246.

Tomaskovic-Devey, D., & Skaggs, S. (2002). Sex Segregation, Labor Process Organization, and Gender Earnings Inequality. *American Journal of Sociology*, *108*(1), 102–128.

Triventi, M. (2013). The gender wage gap and its institutional context: A comparative analysis of European graduates. *Work, Employment and Society*, *27*(4), 563–580.

Verhaest, D., & Van der Velden, R. (2013). Cross-country Differences in Graduate Overeducation. *European Sociological Review*, *29*(3), 642–653.

Yaish, M., & Stier, H. (2009). Gender Inequality in Job Authority: A Cross-National Comparison of 26 Countries. *Work and Occupations*, *36*(4), 343–366.

Tables and figures

Table 1: Dependent variables

Dimension	**Question**	**Computation and values**	**Factor loading if applicable**
Work autonomy*	To what extent are you responsible for setting goals for your own work?	1-5, not at all - to a very high extent	0.452
	To what extent are your responsible for deciding how you do your own job?	1-5, not at all - to a very high extent	0.698
	To what extent do the following job characteristics apply to your current work situation? Work autonomy	1-5, not at all - to a very high extent	0.793
Hourly wage PPP**	What are your gross monthly earnings?	Monthly gross salary in EUR x PPP coefficient/monthly working hours	n.a.
Skill	To what extent are your knowledge and skills utilised in your current work?	1-5, not at all - to a very high extent	n.a.
Job security	To what extent do the following job characteristics apply to your current work situation? Job security	1-5, not at all - to a very high extent	n.a.
Work-life balance/Flexibility***	To what extent do the following job characteristics apply to your current work situation? Good chance to combine work with family tasks	1-5, not at all - to a very high extent	0.772
	To what extent do the following job characteristics apply to your current work situation? Enough time for leisure activities	1-5, not at all - to a very high extent	0.772

* KMO=0.622, Cronbach's alpha= 0.675, principle axis factor (PAF)
**Values of the 3rd and 97th percentile have been assigned to 3rd and 97th percentile, respectively
***KMO=0.5, Cronbach's alpha=0.748, principle axis factor (PAF)
All indicators have been rescaled between 0 and 1 by subtracting the minimum and then dividing by range

Table 2: Descriptive statistics of the dependent variables

		Men	Women	Total
Skill utilisation	Mean	73.257	74.302	73.879
	S.D	25.028	25.886	25.547
Autonomy	Mean	78.316	78.966	78.702
	S.D.	19.978	20.823	20.487
Hourly wage PPP	Mean	21.128	18.628	19.624
	S.D.	9.689	8.465	9.056
Job security	Mean	67.988	70.195	69.302
	S.D	28.803	30.424	29.799
Work life balance	Mean	55.398	59.528	57.856
	S.D	26.027	26.681	26.496

Table 3: Variance partition in job quality dimensions

	Skill utilisation	**Autonomy**	**Hourly wages PPP**	**Job security**	**Work life balance**
Total graduate labour force					
Level 3: Country of employment	N.A.	N.A.	33.67	N.A.	N.A.
Level 2: Sector of economy	44.72*	32.07*	6.80*	75.59*	67.65*
Level1: Individual	590.46*	351.75*	43.32*	821.99*	626.63*
% of variance at the country level	N.A	N.A	40.18%	N.A.	N.A.
% of variance at the sector level	7.04%	8.36%	8.12%	8.42%	9.74%
% of variance at the individual level	93%	92%	52%	92%	90%
Total graduate labour force controlling for 14 individual level variables, 4 sector level variables and 2 country level variables (only in the case of income)					
Level 3: Country of employment	N.A.	N.A.	15.94	N.A.	N.A.
Level 2: Sector of economy	17.47*	25.95*	5.00*	52.71*	40.10*
Level1: Individual	461.93*	302.37*	37.84*	684.38*	577.12*
% of level 3 variance explained by explanatory variables	N.A.	N.A.	52.66%	N.A.	N.A.
% of level 2 variance explained by explanatory variables	60.94%	19.08%	26.49%	30.27%	40.72%
% of level 1 variance explained by explanatory variables	21.77%	14.04%	12.65%	16.74%	7.90%

*p< 0.05
N.A. indicates that there no significance variance at the country level

Table 4: Individual and contextual factors and job quality dimensions (Random intercept models)

-	Skill utilisation	Autonomy	Hourly wages PPP	Job security	Work life balance
Intercept	54.919*	76.205*	15.021*	61.958*	53.181*
Individual level variables					
Female	1.358**	1.845*	-1.622*	2.646*	-0.484
Age	0.178*	0.025	0.169*	-0.271*	-0.255*
Children	-0.640	2.197*	0.188	0.153	4.220*
Occupation (ref. *Associate professionals*)					
Clerks and lower categories	-5.964*	-3.750*	-1.459*	0.742	1.178
Professionals and managers	1.900*	1.520*	1.812*	0.773	-0.114
Supervision	0.961	7.332*	2.142*	2.703*	-3.525*
Hours of work	0.072*	0.092*	-0.069*	-0.055	-0.532*
Firm size	-0.314	-0.881*	0.527*	0.877*	-0.017
Experience in the current job	-0.008	0.008	-0.003	0.033*	-0.001
Contract type (ref. *Unlimited term*)					
Fixed term or temporary	-0.131	-2.271*	-1.381*	-25.934*	-4.247*
Other contract	1.231	0.945	-1.627*	-22.743*	-7.021*
Self-employed	2.119^	4.477*	-0.181	-11.607*	-1.913*
Study field (ref. *Arts and Humanities*)					
Education	-1.721	1.417	1.191*	-1.415	-0.349
Social Sciences, Business and Law	-2.474**	0.004	1.759*	0.769	2.698*
Science, Mathematics and Computing	-2.812	-0.127	0.645	-0.773	2.112
Engineering, Manufacturing and Construction	-5.576**	-1.621	1.166*	1.375	1.814
Agriculture and Veterinary	-5.752*	-0.644	-0.251	0.024	2.996
Health and Welfare	-1.271	-2.349	1.419**	2.496	-0.302
Services	-5.805*	-0.436	0.520	5.814*	3.396
Academically prestigious study programme	1.199*	0.585*	0.496*	0.742^	0.773*
Vocationally orientated study programme	2.160*	0.275	-0.187^	1.053*	0.082
Required level of education for the job (ref. category *Same level*)					
Higher level	4.986*	2.661*	-0.057	2.056**	-1.103
Lower level of tertiary education	-7.662*	-2.232*	-0.950*	3.022*	2.369*
Below tertiary level	-20.941*	-12.300*	-3.581*	-1.569	0.233
Best match job - field of study (ref. *Any field of study*)					
Exclusively own field	22.905*	3.512*	0.194	2.023	0.745
Own or related field	13.508*	2.073^	0.134	-1.019	-0.397
A completely different field	-2.367	1.546	-0.311	-2.584	-0.198

Contextual factors					
% of women graduates (sector)	-3.713	-2.902	-3.154*	4.387	2.504
% of highly educated workers (sector)	-0.064	0.104*	0.094	0.068	0.320*
Dominantly public sector	2.146	3.186*	-1.346	5.483*	16.627*
Skill specificity (sector)	3.585*	-1.547	-1.908*	0.039	-3.838
Union density (country)	N.A.	N.A.	0.087^	N.A.	N.A.
Coverage by collective bargaining (country)	N.A.	N.A.	0.090*	N.A.	N.A.

* $p < 0.05$

^ $p < 0.1$

Table 5: Gender random slopes in job quality

	Skill utilisation	**Autonomy**	**Hourly wages PPP**	**Job security**
Gender slopes - sector				
Intercept	37.508*	22.007*	7.324*	73.772*
S.E.	(11.971)	(4.003)	(0.734)	(11.434)
Intercept and slope	-30.625*	-7.592*	-4.370*	-42.522*
S.E.	(12.603)	(3.786)	(0.742)	(11.589)
Slope coefficient	45.521*	33.340*	7.335*	74.893*
S.E.	(13.711)	(5.883)	(2.013)	(16.631)
Gender slopes - country				
Intercept	n.a.	n.a.	18.459*	n.a.
S.E.			(5.733)	
Intercept and slope	n.a.	n.a.	-2.418	n.a.
S.E.			(1.606)	
Slope coefficient	n.a.	n.a.	1.469*	n.a.
S.E.			(0.491)	
Chi Square values	188.656*	180.855*	437.261*	196.238*
Degrees of freedom	3	3	6	3

All models include all 14 individual control variables and contextual effects (Table 4) which are not reported here in order to avoid repetition.

** $p < 0.05$*

n.a. = Not applicable due to no significant variance at the country level

Table 6: Cross-level interaction between gender slopes and sectoral characteristics

	Skill utilisation	**Autonomy**	**Hourly wages PPP**	**Job security**
Gender Slope coefficient (sector) after added interactions	45.492*	30.800*	7.191*	75.439*
Gender Slope coefficient (country) after added interactions	n.a.	n.a.	1.461*	n.a.
Chi squares after added cross-level interactions	0.028	12.448*	8.613*	0.619
Degrees of freedom	1	2	3	1
Effect on the intercept (Men)				
% of female graduates (sector)	n.a.	n.a.	-1.077	n.a.
S.E.			(1.837)	
% of highly educated workers (sector)	n.a.	0.059	n.a.	n.a.
S.E.		(0.056)		
Dominantly public sector	n.a.	0.067	n.a.	3.940
S.E.		(1.801)		(3.409)
Skill specificity (sector)	3.158	n.a.	-2.376^	n.a.
S.E.	(2.239)		(1.343)	
Coverage by collective bargaining (country)	n.a.	n.a.	0.108**	n.a.
S.E.			(0.030)	
Effect on gender slope (Women)				
% of female graduates (sector)	n.a.	n.a.	-3.243*	n.a.
S.E.			(1.339)	
% of highly educated workers (sector)	n.a.	0.084	n.a.	n.a.
S.E.		(0.071)		
Dominantly public sector	n.a.	4.348^	n.a.	1.780
S.E.		(2.432)		(3.654)
Skill specificity (sector)	0.345	n.a.	1.019	n.a.
S.E.	(2.306)		(1.324)	
Coverage by collective bargaining (country)	n.a.	n.a.	-0.010	n.a.
S.E.			(0.010)	

**p<0.01

* p <0.05

^p < 0.1

n.a. Interactions not included in the model as the main effect on job quality dimensions not significant

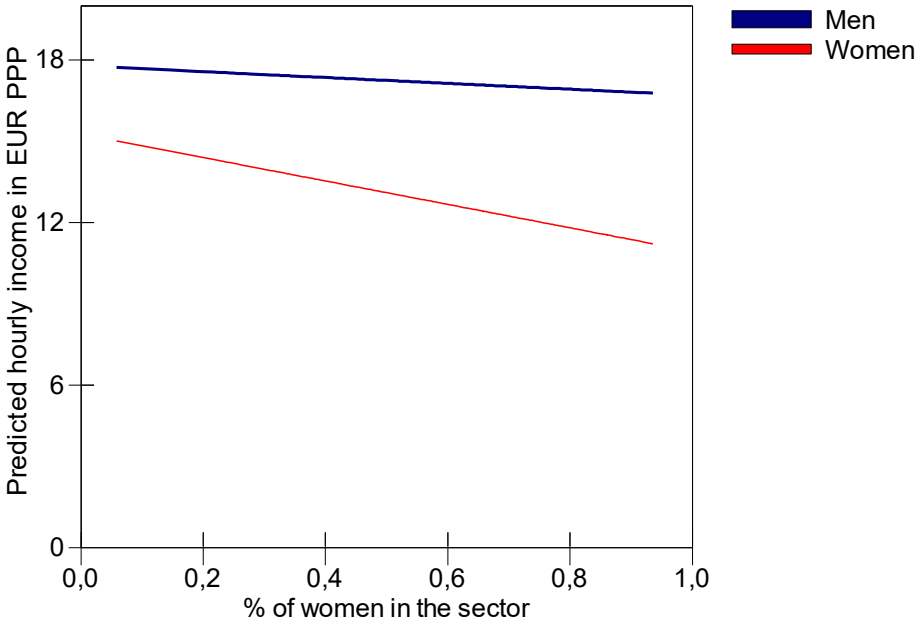

Figure 1: Impact of percentage of female graduates in the sector on gender gap in graduate hourly wages

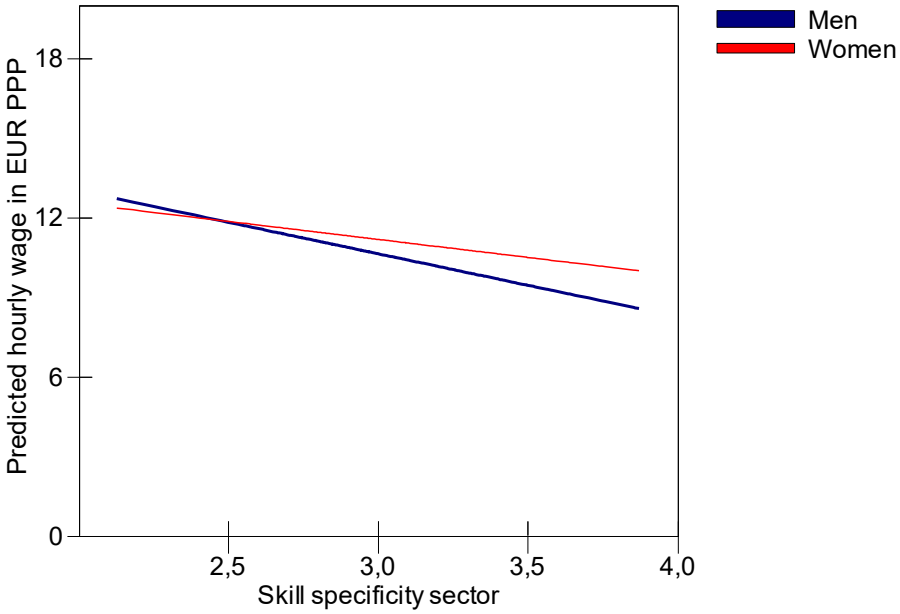

Figure 2: Impact of skill specificity in the sector on gender gap in graduate hourly wages

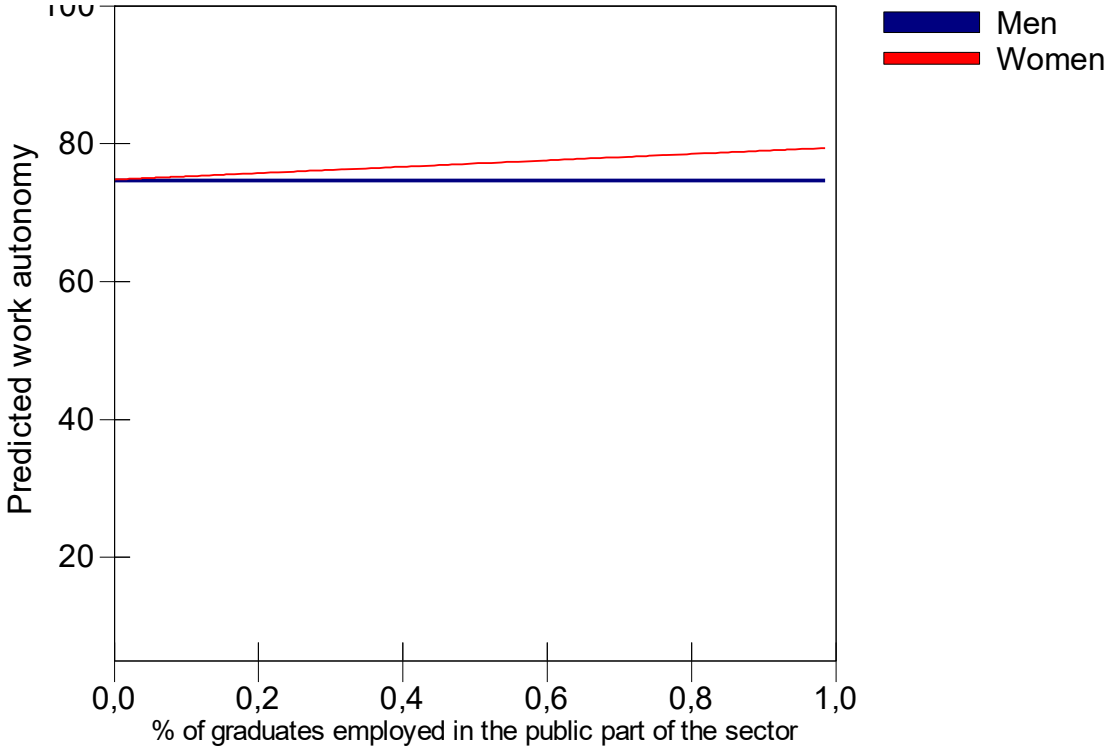

Figure 3: Impact of the dominantly public nature of the sector on gender gap in work autonomy

Online Appendices

Table 1: Analytical levels of the study design – countries and sectors

Level 3: Countries (17 countries)	Analysed REFLEX countries: Austria, Belgium-Flanders, the Czech Republic, Estonia, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden and the UK. Analyzed HEGESCO countries: Slovenia, Lithuania, Poland and Hungary Together, the surveys reached more than 145,000 graduates and had an overall response rate of 31%. Original REFLEX survey also included Sweden, Japan and HEGESCO Survey included Turkey. For the purposes of this analysis, data from Sweden were excluded, since its survey design deviates substantially from other countries (Verhaest & Van der Velden, 2013). Similarly, data from Turkey and Japan were excluded, due to the need to be able to link with data from the EU Labour Force Survey, which was used later in the analysis, for example, to derive weights and some of the explanatory variables required.
Level 2: Sectors (20 different sector types not all present in each country) Total number of country-sector combinations 258	1) Manufacturing; 2) Construction; 3) Wholesale and retail trade; 4) Transport and Communications; 5) Financial intermediation; 6) Computer related services; 6) Research and development; 8) Legal, accounting, bookkeeping and auditing activities; 9) Architectural, engineering and other technical activities; 10) Real estate, advertising and other business services; 11) Public administration and defense; 12) Primary and secondary education; 13) Higher education; 15) Other education; 16) Health; 17) Social work; 18) Media, culture, recreation, membership organisations.
Level 1: Individual jobs	Occupation, Job quality dimensions, Working hours, Type of contract, Educational background, Personal characteristics
Weighting procedure	For purposes of multilevel modeling two sorts of weights were assigned (based on guidance of Centre for Multilevel Modelling, 2011). One first set of weights (level 2 weights) represent the inverse probability of a sector to be selected within a country. The second set of weights (level 1 weights) represents the inverse probability of an individual of specific occupational group to be selected within each sector of economy. For the weights calculation, employed individuals aged between 25 and 34 years and with higher education degrees are taken as the reference group to be the most similar to respondents of the REFLEX and HEGESCO data (more details on weight calculations and their assignment can be provided by the author upon request).

Table 2: Characteristics of employed graduates 5 years after graduation (n=32445)

Personal characteristics	%
Gender	
Male	40.4
Female	59.6
Age	
≤ 26	3.4
27	10.0
28	15.5
29	17.5
30	13.7
31	10.2
32	7.0
33	4.9
≥ 34	17.8
Academic background	
ISCED5A* programmes providing direct access to doctorate	55.2
ISCED5A* programmes not providing direct access to doctorate	44.8
Disciplinary field	
Education	11.9
Humanities and Arts	9.7
Social sciences, Business and Law	32.9
Science, Mathematics and Computing	9.2
Engineering, Manufacturing and Construction	17.1
Agriculture and Veterinary	2.9
Health and Welfare	13.3
Services	3.1
Job characteristics	%
Sector	
Public sector	42.9
Private non-profit sector	6.5
Private profit sector	48.8
Other	1.7
Branch of industry	
A - Agriculture, hunting and forestry	1.0
B - Fishing	0.1
C - Mining and quarrying	0.7
D - Manufacturing	12.2
E - Electricity, gas and water supply	0.9
F - Construction	3.3
G - Wholesale and retail trade; repair of motor vehicles and other goods	4.7
H - Hotels and restaurants	0.7
I - Transport, storage and communications	3.8

J - Financial intermediation	5.2
K - Real estate, renting and business activities	17.6
L - Public administration and defence; compulsory social security	9.4
M - Education	20.4
N - Health and social work	15.1
O - Other community, social and personal service activities	
Size of company/organisation	
1-9	12.8
10-49	17.9
50-99	10.9
100-249	11.8
250-999	15.2
1000 or more	31.5

* International standard classification of qualifications level 5A

Table 3: Independent variables - individual level

Individual level variables	**Description/Question**	**Type and values**
Gender	Personal characteristic	Dummy variable. 1= Female. 0=Male
Children	Do you have children?	Dummy variable. 1=Yes. 0=No.
Age	Base on the question concerning year of birth	A continuous variable centred around the mean for each country
Occupation	*Occupation* measured at the individual level measured on the 1-digit level of ISCO88 classification grouped into 3 distinct occupational categories. The "high occupational group" category included managers and professionals; the "medium occupational group" includes technicians and associate professionals; and the "low occupational group" includes clerks and all remaining occupational categories.	Categorical: High level occupations Medium level occupations Lower level occupations
Supervision	Do you directly or indirectly supervise other members of staff?	Dummy variable. 1=Yes, 0=No.
Average hours of work	Average working hours (in a week including overtime)	Continuous variable: hours centred around the sector mean
Experience in current job	Duration from the start of work in current employment/self-employment	Continuous (months) centred around country mean
Type of contract	Type of contract in the employment or self-employment status	Categorical: Unlimited term or temporary Other Self-employed
Firm Size	How many people work in your organisation?	*Firm size* (centred around sector mean) measured on a 6 point ordinal scale: 1= 1-9; 2=10-49; 3=50-99; 4=100-249; 5=250-999; 6=1000 or more.
Study field	Coded based on the study reference study programme	Categorical: Education Arts and Humanities

		Social Sciences, Business and Law Science, Mathematics and Computing Engineering, Manufacturing and Construction Agriculture and Veterinary Health and Welfare Services
Academically prestigious study programme	To what extent did the following descriptions apply to your study programme – The programme was academically prestigious	5 point scale (centered around country mean) 1=not at all; 5=to a very high extent
Vocationally oriented study programme	To what extent did the following descriptions apply to your study programme – The programme was vocationally oriented	5 point scale (centered around country mean) 1=not at all; 5=to a very high extent
Match between own level of education and the current job requirement	What type of education do you feel is most important for this work?	Categories of degrees compared to own graduate degree and coded into 4 categories: Same level Higher level Lower level of tertiary education Below tertiary education
Match between own field of study and the current job requirement	What field of study do you feel is most appropriate for this work?	Ordinal scale with 4 categories rescaled so that higher values indicate higher specific skill demands : No particular field A completely different field Own or related field Exclusively own field

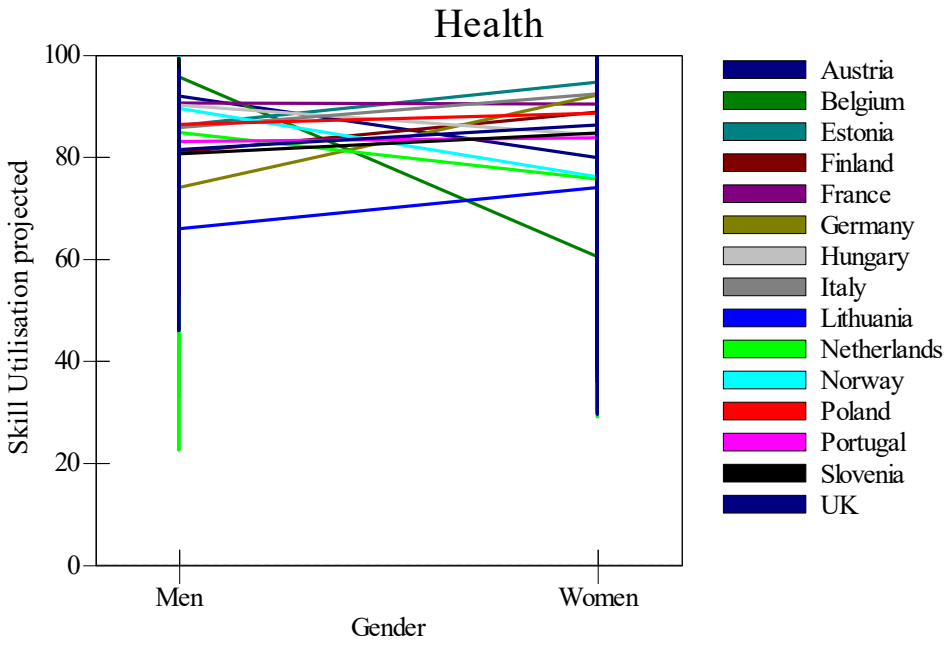

Figure 1: Gender gaps in skill utilisation in the health sectors in Europe

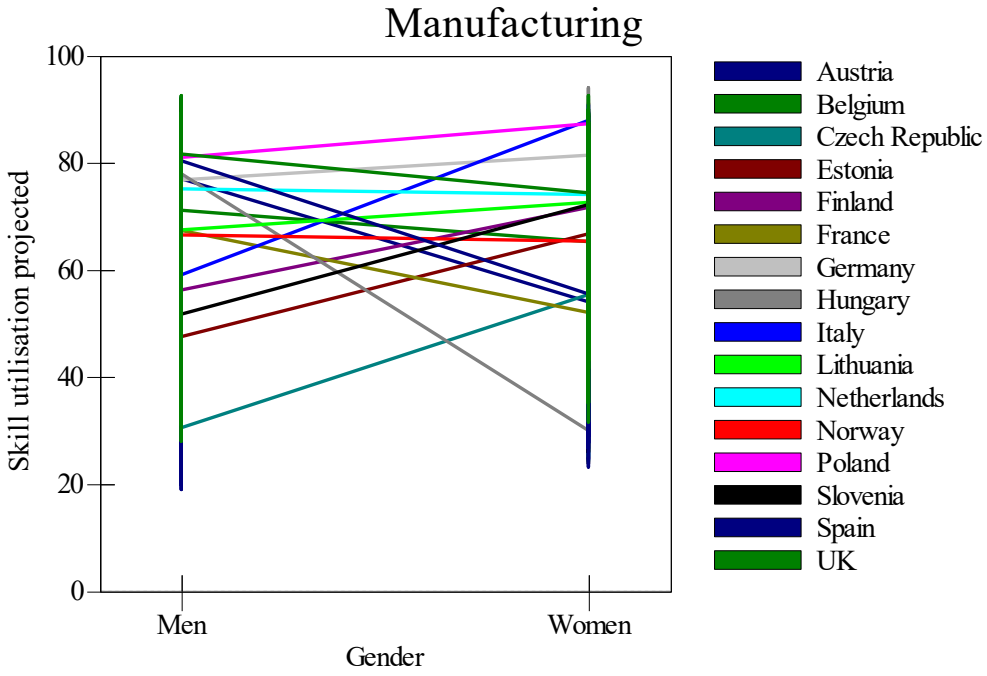

Figure 2: Gender gaps in skill utilisation in manufacturing sectors in Europe